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ABSTRACT

This report presents the results, statistical analysis and implications of classification and attention training curricula field tested with Head Start children by their teachers. Teacher, location of program, and treatment were the variables considered but only treatment effects were significant. Results, summarized in three levels, indicate (1) on some intellectual dimensions, Head Start pupils made gains regardless of the type program in which they participated, (2) specific treatments across experimental groups produced task specific gains, and (3) pupils learn operations but they do not generalize these acquired abilities to other theoretically related areas of cognitive activity. Implications are that a comprehensive Head Start program must begin with an assessment of specific learning needs followed by the use of curricula designed to meet these needs. An approach which begins with perceptual motor manipulation, proceeds to attention training, and concludes with classification training might be more successful than any of its predecessors. See companion paper PS 003 428 which discusses the actual training inputs and document PS 003 429 which presents the research and sampling design. (WY)

RESULTS AND IMPLICATIONS OF A HEAD START CLASSIFICATION AND ATTENTION TRAINING PROGRAM*

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Design for Analysis

The research design incorporated three independent variables (1) treatment effects (2) teacher effects, and (3) location effects. These factors produced a design in which the variables were partially nested and partially crossed, as illustrated in the following diagram.

Figure 1

Analysis Design

Site	Pontiac, Mich.									Detroit, Mich.									
Treatment	Attn		P-M		Class		Lang		Cont	Attn		P-M		Class		Lang		Cont	
Teachers	T_1	T_2	T_1	T_2	T_3	T_4	T_3	T_4	T_5	T_6	T_7	T_6	T_7	T_8	T_9	T_8	T_9	T_{10}	

Training Groups: Attn = Attention, P-M = Perceptual Motor; Class = Classification; Lang = Language

The three major variables can be handled with analysis of variance; however, the treatment variable has five levels which must be assessed. Therefore, the analysis used to study these conditions was a multivariate analysis of covariance.

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One of the major concerns in the design of the study was controlling the teacher variable since budget did not allow the kind of measurement that could have provided statistical control. For this reason, teaching environments were matched as closely as possible. Table 1 summarizes the multivariate analysis of covariance for the three main factors. Teacher differences did not account for a significant portion of the variance, nor did the location of the treatments. The treatments themselves did, however, as all treatment effects across all groups were significant, ($p < .001$.)

Results

To simplify organization of the great amount of information generated by a large test battery and the multivariate analysis, results will be presented at three levels and by three general groupings of the dependent variables. The first level concerns significant findings for the total sample. In this study the control group constituted regular Head Start classrooms rather than a no treatment group. Thus all groups received some type of educational input. Secondly, there was a continuity of process common to all experimental groups versus the control group, and some results are pertinent to this condition. Finally, there were treatment effects between experimental groups which are relevant to the theoretical issues of this study.

Dependent variables can be grouped into (1) analytic tests, which include the WPPSI performance tests and the embedded figures test. In each of these tests, the solution requires a perceptual analysis of the test configuration followed by a motoric response; (2) general intelligence tests, which include the Stanford-Binet and Caldwell Preschool Inventory.

These tests present the respondent a variety of tasks ranging from perceptual motor to pure verbal and; (3) classification tests. The Multiple Classification Test used in this study presents categorization tasks in two modes: actual objects, and exact size color pictures of the same objects. There are also two response styles, active and passive. In the active style the subject forms groupings from an array by himself, while in the passive style he is asked to label a grouping presented by the examiner. Other tests were also administered to measure creativity (Response Variability) and attention span.

General Effects. As stated earlier all treatment effects across the total sample were significant. In addition there were some results of general interest that cannot be attributed to specific treatments. Of the analytic group of tests, the total Performance Score of the WPPSI was significant for all groups at the .04 level or less (Tables 4-8). On the tests of general intelligence the gain of the total sample on the Caldwell Pre School Inventory was significant, ($p < .01$). This was not true, however, of the Stanford-Binet. Concerning multiple classification, all groups gained significantly in this ability although there were significant differential effects to be discussed shortly. These general results indicate that on these important intellectual dimensions, Head Start pupils made significant gains regardless of the type of educational programs in which they participated.

Several comparisons from the correlation tables, Tables 9 and 10, bear out the notion that not only did Head Start pupils gain in these dimensions, but that integrative effects occurred also. The Embedded Figures Test, which is a measure of perceptual control and field independence,

correlates much higher with most analytic items on the post tests versus pre tests. Likewise the WPPSI Animal House subtest, which had low to negative correlations with other WPPSI subtests on pre testing, showed significant correlations with these same subtests on post testing. To a lesser degree this was also true of the Multiple Classification subtests, but nevertheless suggest increased integration of the function of perceptual control of complex stimuli. One very interesting comparison is that of attention span with the categorization items. Pre test correlations were zero to negative values which reversed to positive values upon post testing. This seems to indicate an organization of attention to problem solving where the problem is presented in tangible manipulative materials. A similar relationship occurred with most of the WPPSI performance tests, but interestingly not with the general intelligence measures which are composed of more verbal items. Inter-correlations between all analytic and classification tests generally showed increased magnitudes in comparing the pre and post test tables 9 and 10). Thus, between tests developed from differing theoretical bases, but which required attention and perceptual control, the total group showed integration of this function.

General Experimental Effects. All four experimental treatment groups shared some common elements that differed from the control group both in procedure and content. The procedural difference was that all experimental groups were structured so that teachers worked with small groups of four children away from the rest of the class, and followed a specific instruction plan. The commonality of content was that all experimental treatments inherently contained attentional training. This is to say, that Classification and Language training by necessity includes attentional

training, but the Attention and Perceptual-Motor training specifically exclude classification training. Fortunately there was one test -- the WPPSI Picture Completion subtest -- which is purely attentional in the sense used here. As shown in Table 3 when all four experimental groups are compared with control the difference is significant at the .05 level. Thus, attention training in a variety of formats produced specific results. The other significant difference between experimental groups and control, shown in the same table, is the Stanford-Binet. This difference was significant at the .01 level, and perhaps is more of a reflection of procedure than anything else since the Binet is a heterogeneous rather than a single task type test. In the experimental groups teachers administered planned lessons during which she made certain each child understood the materials and responded to the instruction. This interaction, requiring instruction by the teacher and listening and responding to very specific operations by pupils, is not unlike the situation existing between tester and subject in the administration of the Binet. This, however, is not a particularly strong argument, and an item analysis is being conducted. The Binet notwithstanding, what does seem important from a theoretical point of view is that specific treatments across experimental groups produced task specific gains.

Treatment Effects. An emerging picture of the results of the study points to the possibility that Head Start pupils learn operations they are taught but do not generalize these acquired abilities to other theoretically related areas of cognitive activity. This idea is borne out by the effects of the experimental treatments. To be more specific, children who received attention training did not do better in classification, although this

theoretically would have been expected. Sigel's earlier research with advantaged children indicated that within the Piagetian developmental hierarchy, training in a precursor cognitive skill induced the development of skills at the next cognitive level. This seems not to be true with disadvantaged children. Accordingly, children who received classification training did better in direct relationship to the intensity of the training they received. As shown on Table 2 the rank order of treatment groups on classification post tests (MCT) in the covariate design were (1) Classification (2) Language (3) Control (4) Attention and (5) Perceptual-motor. Table 3 compares the means of these groups and indicates that the Classification and Attention groups differed at the .05 level. It could be argued, of course, that the classification training was test specific and these results would therefore be invalid. There was one result that supports the theoretical structure however, since the test itself was not a classification test per se, yet required the same cognitive activity as classification. The WPPSI Animal House requires the mental operations of attention followed by the cognitive act of decentering to a representational object -- a colored wooden peg -- followed by correct manipulation of a similar colored peg to confirm the operation. The classification and language groups differed significantly from the control group on this subtest (Table 3). Thus, there seems to be adequate evidence from several different standpoints to confirm the notion that Head Start children respond to specific educational treatments, but that educators cannot make the assumption that any significant transfer of learning to other related areas occurs.

Implications

The most obvious implication of these findings is that a comprehensive education of Head Start children must begin with an assessment of specific learning needs followed by the use of curricula that meet these needs. Certainly there is nothing revolutionary in this statement, but it does speak directly to two extremes in educational programming commonly seen in practice today. At one extreme is the traditional approach in which children are allowed much free play with manipulative materials. The teacher's task is to capitalize on situations that arise in this unstructured situation to teach specific points. Additionally in the traditional curriculum there is often storytelling and group games. This approach to preschool education is inappropriate for Head Start children because while it includes much personal teacher-pupil interaction, it lacks structural teaching. Moreover, individual teacher-pupil learning situations are left to chance. The other extreme is the highly structured unifocal curriculum which trains a single skill intensely with the assumption that acquisition of this skill will allow or foster other kinds of learning. An example is the Attention training of this study. There are many similar programs available, but the problem with these is that only task specific learning occurs with little or no transfer, as already discussed. Also teachers do not always respond favorably to programs of this type since they minimize the professional role of the teacher.

These experiences have suggested an alternate approach which attempts to take into account more of the variables in the teaching environment -- something of a quasi-systems approach, so to speak. This approach takes into account pupil needs, teacher needs, administrative needs, and of

course, a curriculum that mediates all of these. From the curricula of the experimental programs used in this study, together with teachers' comments and suggestions, Dr. Earhart has developed a new curriculum which begins with perceptual motor manipulation, proceeds to attention training and is completed with classification training. The program is being field tested presently. However, even if the program is more successful than any of its predecessors, it is not viewed as the answer to Head Start curriculum problems. It would at best provide a starting point to be modified to specific needs of any Head Start operation according to the other parameters in the system.

Code for Tables

Bin	Stanford Binet
PSI	Caldwell Preschool Inventory
EFg	Embedded Figures
AnH	Animal House*
PiC	Picture Completion*
Maz	Mazes*
Geo	Geometric Design*
Blk	Block Design*
WPS	Wechsler Performance Score*
RVa	Response Variability
AtS	Attention Span
APC	Active Pictures Categorization
PPC	Passive Pictures Categorization
AOC	Active Objects Categorization
POC	Passive Objects Categorization
MCT	Multiple Classification Total

*Wechsler Preschool and Primary Scale of Intelligence (WPPSI)

TABLE 1

Summary Table for Multivariate, Univariate
and Step Down Analysis of Covariance

		Site		Treatment		Teacher	
Multivariate	F	1.0981		2.7223		1.1850	
	df	7, 81		28, 293		70, 479	
	P Less Than	.3724		.0001		.1584	
Univariate	Variable	F	P Less Than	F	P Less Than	F	P Less Than
	MCT	1.84	.178	5.24	.001	0.55	.852
	Bin	0.15	.696	3.63	.009	1.29	.247
	AnH	3.70	.058	3.48	.011	1.74	.085
	PiC	2.29	.134	2.93	.026	0.90	.535
	Geo	0.32	.574	0.78	.542	1.26	.266
	Maz	0.27	.605	1.02	.400	1.02	.433
	Blk	0.22	.643	1.46	.223	1.59	.123
Step Down	Variable	F	P Less Than	F	P Less Than	F	P Less Than
	MCT	1.84	.178	5.24	.001	0.55	.852
	Bin	0.03	.871	3.64	.009	1.40	.192
	AnH	3.40	.069	2.61	.041	1.56	.132
	PiC	0.73	.397	3.49	.011	1.02	.433
	Geo	1.03	.313	2.05	.095	1.47	.164
	Maz	0.48	.490	1.42	.235	0.99	.461
	Blk	0.27	.604	0.61	.657	1.38	.201

TABLE 2

Post Test Means for Seven Dependent Variables*

Variable	Attention	Perceptual Motor	Classification	Language	Control
MCT	14.257	11.026	23.534	19.749	14.943 ~~12.943~~
Bin	100.962	98.986	99.172	97.181	92.285
AnH	9.197	9.220	10.782	10.147	8.500
PiC	11.300	11.376	10.528	10.483	9.304
Geo	8.778	9.427	9.685	9.061	9.842
Maz	8.857	10.159	9.071	8.723	9.207
Blk	10.415	11.348	10.233	10.208	9.576

*Each adjusted for all seven pre-score covariates

TABLE 3

Univariate Scheffe' Post-Hoc Comparisons
for Treatment Group Means in Table 2**

Variable	Comparison	Confidence Interval Lower Limit	Upper Limit	Significance
Multiple Classification	$\bar{x}_3 - \bar{x}_1$	.49	18.06	.05
	$\bar{x}_3 - \bar{x}_2$	1.69	23.33	.01
	$\bar{x}_3 - \bar{x}_5$	.36	16.82	.05
	$\frac{(\bar{x}_3 + \bar{x}_4)}{2} - \frac{(\bar{x}_1 + \bar{x}_2)}{2}$	4.65	13.35	.01
Stanford Binet	$\bar{x}_1 - \bar{x}_5$	2.73	14.63	.01
	$\bar{x}_2 - \bar{x}_5$	.75	12.65	.01
	$\bar{x}_3 - \bar{x}_5$	.94	12.84	.01
	$\frac{\bar{x}_1 + \bar{x}_2 + \bar{x}_3 + \bar{x}_4}{4} - \bar{x}_5$	.84	12.74	.01
WPPSI Animal House	$\bar{x}_3 - \bar{x}_5$	.01	4.55	.01
	$\frac{\bar{x}_3 + \bar{x}_4}{2} - \bar{x}_5$	.01	3.83	.025
WPPSI Picture Completion	$\frac{\bar{x}_1 + \bar{x}_2}{2} - \bar{x}_5$	.16	3.91	.025
	$\frac{\bar{x}_1 + \bar{x}_2 + \bar{x}_3 + \bar{x}_4}{4} - \bar{x}_5$	.08	3.15	.05

*$\bar{x}_1$ = mean for Attention Training group
$\bar{x}_2$ = mean for Perceptual Motor group
$\bar{x}_3$ = mean for Classification Training group
$\bar{x}_4$ = mean for Language Training group
$\bar{x}_5$ = mean for Control Training group

**Only the significant comparisons are presented here. For all variables, comparisons were calculated between all pairs of means and for all combinations of means that were considered to be of theoretical interest.

TABLE 4

Pre Test - Post Test Comparisons
Attention Training Group

Variable	Pre $\bar{X}$	S.D.	Post $\bar{X}$	S.D.	t value	Sig.
Bin	97.10	9.87	103.62	9.76	2.62	.017
PSI	30.91	9.89	39.71	8.47	4.10	.001
EFg	8.19	2.66	10.43	2.14	2.87	.009
AnH	8.95	2.22	9.62	3.01	.93	.366
PiC	9.00	2.57	11.81	2.42	3.31	.004
Maz	8.67	2.56	9.29	2.65	1.12	.277
Geo	9.14	4.52	9.05	3.23	- .13	.901
Blk	8.86	3.20	10.86	2.33	2.28	.033
WPS	92.19	11.54	100.00	11.67	3.34	.003
RVa	5.05	3.74	8.05	4.86	2.15	.044
AtS	11.31	11.66	9.55	6.75	- .79	.438
APC	3.05	4.13	4.91	4.80	2.35	.029
PPC	1.43	2.04	2.33	2.65	1.41	.174
AOC	3.48	3.93	6.05	4.18	2.79	.011
POC	1.52	1.63	4.00	2.93	2.94	.008
MCT	9.48	10.14	17.24	13.27	2.85	.010

TABLE 5

Pre Test - Post Test Comparisons
Perceptual Motor Training Group

Variable	Pre $\bar{X}$	S.D.	Post $\bar{X}$	S.D.	t value	Sig.
Bin	92.00	13.94	99.00	14.50	2.85	.010
PSI	29.32	13.31	37.53	10.13	3.03	.007
EFg	7.84	2.85	9.37	2.56	1.59	.130
AnH	8.95	2.41	9.32	2.00	.66	.515
PiC	8.89	2.83	11.58	2.71	2.74	.013
Maz	8.53	2.89	10.21	2.90	2.32	.032
Geo	9.53	3.08	9.74	2.73	.34	.737
Blk	8.11	2.79	11.37	2.29	3.03	.007
WPS	91.95	11.86	101.95	7.40	3.30	.004
RVa	5.95	3.26	7.79	4.04	1.67	.112
AtS	8.06	5.68	9.00	5.12	.53	.605
APC	2.74	4.11	4.42	5.07	1.81	.087
PPC	1.74	3.11	2.47	2.95	.99	.336
AOC	3.74	4.47	4.89	4.81	1.84	.083
POC	1.95	2.97	2.32	2.58	.57	.576
MCT	9.68	12.49	14.11	14.65	1.96	.006

TABLE 6

Pre Test - Post Test Comparisons
Classification Training Group

Variable	Pre $\bar{X}$	S.D.	Post $\bar{X}$	S.D.	t value	Sig.
Bin	92.59	13.64	99.70	12.16	2.68	.013
PSI	30.44	10.67	40.00	8.50	4.50	.001
EFg	8.11	1.93	9.89	2.31	3.13	.004
AnH	7.82	3.09	10.82	2.99	3.13	.004
PiC	8.82	1.92	10.59	2.74	3.04	.005
Maz	8.07	3.04	9.19	3.28	2.37	.025
Geo	9.41	2.75	9.74	2.82	.61	.549
Blk	9.00	3.06	10.30	2.81	2.30	.030
WPS	90.19	13.24	100.19	15.24	3.97	.001
RVa	5.52	2.74	8.44	3.94	2.91	.007
AtS	5.46	3.98	11.56	7.79	2.95	.007
APC	1.41	1.91	7.26	3.69	4.48	.001
PPC	.59	1.12	3.63	3.20	3.81	.001
AOC	2.07	3.20	7.56	4.06	4.05	.001
POC	.82	1.50	3.70	3.01	3.58	.001
MCT	4.89	6.55	22.33	11.19	4.52	.001

TABLE 7

Pre Test - Post Test Comparisons
Language Training Group

Variavle	Pre $\bar{X}$	S.D.	Post $\bar{X}$	S.D.	t value	Sig.
Bin	89.24	12.61	95.00	14.15	2.43	.027
PSI	29.00	7.85	38.35	7.36	3.37	.004
EFg	7.82	2.77	9.82	2.32	2.37	.031
AnH	6.88	1.97	9.82	1.91	3.09	.007
PiC	7.88	2.89	10.00	2.89	2.47	.025
Maz	8.00	2.67	8.65	3.66	1.20	.247
Geo	8.77	2.82	8.35	3.06	- .57	.575
Blk	8.65	2.52	10.00	3.66	1.48	.158
WPS	87.06	12.63	95.65	16.80	2.51	.023
RVa	5.65	4.20	6.53	5.19	.52	.607
AtS	5.62	3.49	11.77	15.54	1.48	.158
APC	1.12	1.76	5.41	3.86	2.98	.009
PPC	.41	1.23	1.82	1.88	2.43	.027
AOC	1.24	1.95	5.47	4.16	2.99	.009
POC	.53	1.38	2.18	1.70	2.90	.011
MCT	3.24	5.43	15.11	10.11	3.17	.006

TABLE 8

Pre Test - Post Test Comparisons
Control Training Group

Variable	Pre $\bar{X}$	S.D.	Post $\bar{X}$	S.D.	t value	Sig.
Bin	89.42	10.41	91.27	8.96	1.01	.322
PSI	27.50	9.29	36.65	9.47	4.00	.001
EFg	7.35	2.62	9.62	2.10	2.84	.009
AnH	8.23	2.72	8.27	2.31	.06	.951
PiC	8.34	2.13	9.08	2.17	2.10	.046
Maz	7.27	2.92	8.58	2.97	1.99	.058
Geo	9.96	3.66	9.88	2.75	.13	.897
Blk	8.58	2.97	9.23	2.55	1.07	.297
WPS	88.04	12.52	93.35	11.34	2.21	.037
RVa	5.50	3.72	7.81	4.42	2.21	.036
AtS	7.14	5.39	8.88	7.12	.97	.343
APC	2.08	2.68	5.31	4.80	2.53	.018
PPC	1.08	1.41	1.81	1.65	1.97	.059
AOC	2.08	2.12	5.81	4.88	3.20	.003
POC	1.12	1.68	2.81	2.87	2.74	.011
MCT	6.35	5.51	14.88	12.54	3.10	.005

TABLE 9

Correlations of Pre-Test Scores*

	Bin	PSI	EFg	AnH	PiC	Maz	Geo	Blk	WPS	RVa	AtS	APC	PPC	AOC	POC
Bin															
PSI	49														
EFg	20	39													
AnH	26	27	17												
PiC	54	50	29	13											
Maz	20	36	24	24	34										
Geo	39	35	10	-01	15	25									
Blk	42	38	17	-09	29	30	50								
WPS	56	59	29	37	57	64	69	71							
RVa	27	32	08	20	02	11	21	08	20						
AtS	08	07	15	04	09	03	09	11	09	02					
APC	22	40	12	-11	24	06	12	24	20	28	-13				
PPC	28	34	04	05	35	15	10	23	26	27	-13	56			
AOC	35	40	15	-03	35	13	14	20	26	29	-04	73	49		
POC	30	40	10	06	40	19	09	21	31	23	00	61	61	69	
MCT	35	44	14	-03	38	13	14	24	29	31	-10	89	69	92	68

*Adjusted for cell means. df=94 5=.20, p≤.05; r=.24, p≤.02; r=.27, p≤01

TABLE 10

Correlations of Post-Test Scores*

	Bin	PSI	EFg	AnH	PiC	Maz	Geo	Blk	WPS	RVa	AtS	APC	PPC	AOC	POC
Bin															
PSI	51														
EFg	24	44													
AnH	35	29	34												
PiC	31	27	30	43											
Maz	27	35	29	21	26										
Geo	57	41	33	36	33	25									
Blk	27	41	51	32	33	50	30								
WPS	49	48	52	62	65	69	67	72							
RVa	-01	24	13	17	14	25	-04	19	19						
AtS	09	02	13	13	09	27	15	26	27	07					
APC	38	49	15	22	29	19	29	09	29	09	04				
PPC	31	46	20	26	32	22	29	15	34	10	13	71			
AOC	39	54	23	22	35	18	30	14	31	20	11	84	59		
POC	33	41	20	26	42	19	28	22	36	27	10	63	57	75	
MCT	40	52	20	25	37	24	30	13	35	18	11	92	77	92	82

*Adjusted for cell means. df-94 r-.20, p≤.05; r=.24, p≤.02; r=.27, p≤.01